
Space Weather Forecast

Issued on Sunday, 26 November 2023 at 01:20 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: Isolated Moderate flares/R1-R2 Radio Blackouts likely throughout. Chance of Minor Geomagnetic Storms Days 1-2 (25-26 Nov).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Low, with a peak Common-class flare from near the eastern limb at 25/1440 UTC. There are currently twelve sunspot groups on the visible disc, the majority of which are located in the eastern half of the solar hemisphere. Near centre disc in the northern hemisphere there is a cluster of four sunspot groups that appear to be contained within the same area of plage and magnetically connected. The largest group is a magnetically complex region in the southeast. One region in the southwest of the disc has shown recent growth and a slight increase in complexity. The other groups remain comparatively small and more magnetically simple.

Although CMEs have been observed on coronagraph imagery leaving the Sun over the past 24 hours, confidence is high that these do not have Earth-directed components.

Solar Wind / Geomagnetic Activity: Solar wind parameters were initially at slightly elevated levels around 470 km/s, and saw more significant jump and minor discontinuity around 25/0800 UTC to elevated levels. This enhancement is indicative of a CME arrival at Earth, speculated to be from the arrival of the 22 Nov CME originating from the rupturing of a filament. Levels increased to strong at times from around 25/2030UTC and 25/2240UTC, before returning to elevated levels. The IMF was predominantly at moderate levels, before falling to weak from 25/2200UTC. The important north-south component varied weakly at first, but since the CME arrival has fluctuated more significantly and has been strongly southward since around 25/0600 UTC before varying weakly again from around 25/1900UTC. The resultant geomagnetic activity was initially Unsettled (Kp3) and has been mostly at Active levels since the 25/0600-0900 UTC interval, however during the 25/1800-2100UTC interval it increased to Moderate storm (G2/Kp6) levels, before returning to active for the 25/2100-26/0000UTC level.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate activity is expected with further isolated Moderate class flares and a slight chance of a Strong flare. The main flare risk is from regions currently positioned on the eastern solar hemisphere and from the cluster close to centre disc in the north.

Solar Winds / Geomagnetic Activity: Two further Coronal Mass Ejections (CMEs) feature in the forecast period. A filament eruption CME observed on 24 Nov is expected to arrive early Day 1 (26 Nov). A further CME resulting from the M1.1 flare from AR3499 on 24 Nov has been analysed and modelled as a likely miss, with just a slight chance of a glancing blow on Day 2 (27 Nov).

Solar winds are currently enhanced following the recent CME arrival and are around 550 km/s. There is some uncertainty if these elevated wind speeds are currently due to connection with a high speed stream from a coronal hole or due to lingering enhancement from the earlier CME. If

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we are enduring the lingering effects of the earlier CME we may see a decrease in the solar wind speed back to slightly elevated levels during the early period of Day 1 (26 Nov), before speeds increase again to elevated or perhaps strong levels during day 1 due to enhancement from the second CME arrival and high speed stream onset which could potentially coincide. As such there is significant uncertainty in the short term but speeds expected to be around 550-600km/s.

Geomagnetic activity is currently active (Kp 4), and may reduce to mainly Unsettled levels ahead of the next CME arrival early Day 1 (26 Nov), however this depends if we are already connected to CH75/+ in which case we may not see any reduction in geomagnetic activity in the short term. However on arrival of the next CME geomagnetic conditions of unsettled to G1/minor storm (Kp 3-5) conditions are probable, with a slight risk of G2/Moderate storm (Kp6) due to combined CME and HSS effects. Combined CME and HSS influences may extend a period of somewhat enhanced Geomagnetic into Day 2 (27 Nov), with Quiet to Unsettled levels (Kp 1-3) but should subside to become mostly Quiet (Kp 0-2) by Day 3 (28 Nov).

Energetic Particles / Solar Radiation: No solar radiation storms are expected. However, there is a slightly higher risk of observing S1/Minor Storm conditions compared to normal, given the number of sunspots currently on the disc and their propensity to move into a more favourable location on the disc for connection with Earth in the coming days.

Geomagnetic Storms:

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	Yes	70	20	5	1
Strong	G3	No	20	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	60	60	60	60
Very Active	R3 to R5 X	No	10	10	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm ⁻² sr ⁻¹ s ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	10	15	15	15
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = cm⁻²sr⁻¹s⁻¹)